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Western points. Coke is made in Chattanooga for \$5 a ton ; but it is worth \$45 a ton in Nevada, and \$60 a ton in the City of Mexico. It is the best coke in the world for smelting, and Alabama already ranks next to Pennsylvania in the supply.

In Western Virginia and North Carolina, eastern Tennessee and Kentucky and northern Georgia and Alabama, the Appalachian mountains have deposits of iron ore and coal in close proximity. Virginia has similar deposits of iron and lime. Brown hematite and magnetic ores are being worked in that State, but not the specular ores. Kentucky is full of good ores that have been worked to a very small extent. At South Pittsburgh, Tenn., the ore has 37 per cent. of iron, and no flux is necessary with the lime. At Knoxville, car wheels are made from cold-blast charcoal iron, a most difficult process. Alabama has red hematite in deeper veins than Pennsylvania. It assays 47 per cent. of iron, while the brown hematite assays 55 per cent. Texas has hematite, magnetic, and specular ores, which will yet find a Northern market. The basic process for steel is being used in the South with good results. In a recent year the output of pig iron in the United States was over 9,500,000 tons, of which nearly 1,000,000 tons were made in six months in the Southern States. Alabama now turns out almost as much iron as the entire South did four years ago, and Alabama pig has superseded Scotch pig in Chicago. That State now holds the third position ; Pennsylvania, the first ; and Ohio, the second. Virginia leads the Southern States in the production of rolled iron ; and nearly all the rolled steel South of the Potomac and Ohio rivers comes from West Virginia.

What is needed most in the South is, not the production of great quantities of pig iron, but, rather, the increase of manufactures of all grades, even the finest. The city of Richmond supplies seven States with nails, hardware, agricultural implements, and machinery. There is no reason why every Southern city should not be a centre for factories of these articles and many others. The miscellaneous industries of the South would then require double the \$175,000,000 of capital now invested, and more commercial centres would meet a want that has long been felt. The Census of 1890 showed that the wealth of the Southern States has outrun their gain in population. As much cannot be said for the average of the Northern States during the same period.

It is evident that the South has at hand, and therefore cheap, all the raw materials entering into manufactures ; that its labor and cost of living are cheaper than at the North ; that it can, in consequence, manufacture goods of all kinds at less cost than the North or the West ; that it can not only supply the home demand, but also export goods with profit ; that in the finer lines of manufactures it is extending its operations with success ; and that, to compete with it, wages in the North must be reduced. With all these advantages on its side the fault will be with the South if it fails to reach out its hands and take what nature has so kindly offered.

FREDERIC G. MATHER.

THE NEED OF BETTER ROADS.

THE Malthusian doctrine of population teaches that the people will increase faster than the means to sustain them, and that it is only a question of time when the population will press upon the means of subsistence

so as to prevent further increase in numbers, or, in other words, that the entire energy of the people will be insufficient to supply them with food. Whatever ultimate truth there may be in this doctrine, it has no application to this country in our day and generation, for the reason that the food product has increased and is increasing faster than the population, notwithstanding the fact that the population has increased with great rapidity, and substantially according to the Malthusian rule of doubling once in twenty-five years. The explanation of this most important fact is not to be found in any changed condition of nature, by which her bounty is increased, but in the increased power and productiveness of human labor, whereby the output of product proceeding from the same unit of exertion has been increased from two to ten fold. This being true, a diminished proportion of the population is sufficient to supply all with food products, and an increasing proportion are thereby released from the necessity of producing the food supply necessary to sustain themselves.

It is a material question in the industrial progress of the country, how the labor so released from the former necessity can be best applied to minister to human wants. They can no longer be employed, nor employ themselves to any advantage or profit, in the industrial villages that formerly flourished in the agricultural regions within short distances of each other, for the reason that the output of their product when so employed by solitary and primitive methods, does not show that increased output which human labor should show, and does show, when congregated together in great numbers, so that the division of labor and the application of machinery come in to supplement their power.

The concentration of population, which has astonished so many, was inevitable, for it would be impossible to successfully and continually employ a larger proportion of the population in producing food than is necessary to produce a sufficient supply, and it would be equally impossible long to employ the increasing number of those not required in the production of food in primitive and solitary industrial processes which fail to increase the output of their product when other means have been devised which increase that product many fold in connection with the concentration of population and the division of labor.

Cheap transportation has contributed much to the increased capacity of labor, by making it possible to concentrate surplus food products and material for manufacture. The increasing ease with which the food products, the materials of manufacture, and the population are concentrated together by means of cheap and still cheapening transportation, together with the increasing output of product which results from human labor under such conditions, makes it certain that the prevailing condition by which nearly one-half of our population in the older settled parts of the country is concentrated in cities is a normal and not an abnormal condition, and being based upon scientific causes is permanent and not temporary.

There are three factors which produce the existing result. First, a cheap and abundant food produced by a diminishing proportion of the people. Second, a cheapened means of transportation whereby these products and the material for manufacture may be easily concentrated in the great centers of population; and, third, the increasing output of product which manifests itself where labor is concentrated and the division of labor is supplemented by the application of machinery.

Cheap transportation, so far as developed up to the present time, shows

itself mainly in the decreased rates upon steamships and steam cars; and the rates have been so greatly lessened by these means that it is possible to transport a ton a thousand miles upon the great lakes at the same cost as would be required to move it five miles with a horse and wagon over a common road. Two hundred and fifty miles may also be reached at the same cost upon the steam cars. But with horses and wagons the rate of transportation has remained almost unchanged during all the years of this great development in cheap transportation.

Those who live in the rural districts and have seen the villages deserted, the farmhouses abandoned, the population reduced in numbers, the rewards of their industry decreased, and the value of their property diminished, adversely criticise the fact that national and State roadbuilding has been dropped, and that railroad building has been very extensive during the last thirty years, and think that if the same energy and expenditure were given to the improvement of the common roads, the results would be equally beneficial, and perhaps more beneficial than those that have followed the era of railroad building.

I do not share in these opinions, and believe that the reason we have failed to cheapen transportation by means of horses and wagons results from the intrinsic weakness of such means rather than from the lack of devotion to them. The system of State and national roads, as formerly instituted, was intended to supply the means of through or long-distance transportation. The highest rate that prevails upon the steam cars is lower than the lowest rate that could ever prevail upon wagon roads built with public money, and the use contributed free to the carrier without toll. So nothing could be more absurd than the idea of taking public money to do that which is already better done without the burden of taxation. So far as county and township roads are concerned, while still necessary, their improvement would be unwise if they should be improved without reference to the facts already stated above pertaining to the abandoned industries and the deserted villages.

A local system of improved or macadamized roads, built with a view of connecting villages that are now deserted, or of supplying the needs of a community equally distributed throughout the country, would not justify the expectation of those who contend for it. The rate of transportation with horses and wagons can never be brought on the average below twenty-five cents per ton per mile, while the average cost that prevails upon the steam cars is not to exceed one cent per ton per mile, and in many instances but half a cent a ton a mile. The steam railroads have served and will continue to serve a great purpose, but it is probable that the limit of their usefulness is nearly reached so far as the ramification of their branches is concerned; but at the very point where the ramification of these roads ceases to be an advantage, the electric road comes in and is destined to contribute still more to cheapen transportation than it is possible that the horse and wagon can do by any amount of expenditure directed to that end. The average cost per ton-mile upon the electric cars would not exceed five cents, and the cost of building the steel roadbed suitable for such cars to run upon would be no greater than the cost of building stone roads.

I therefore advocate an important and far-reaching change in the manner of building country roads. My plan is to extend the street-car tracks from our cities out into the circumjacent territory a distance of thirty or forty miles, so that all the territory between centres of popu-

lation sixty or eighty miles apart would be reached. Let these tracks be so made and laid that wagons and carriages propelled by horses may go upon them, as well as cars propelled by electricity or other inanimate power.

It is already demonstrated that only one-eighteenth of the power is required to move a vehicle over a smooth steel track that would be required to move it over a gravel road, or one-eighth of that which would be required to move it over the best pavement. When this important fact becomes generally known to the farmers, they will realize that it is a poor policy to promote the building of macadam roads when an equal outlay would provide a good steel track. When the track is once provided so that cars and carriages propelled by horses can also go upon the same tracks with cars propelled by electricity, the superiority of the inanimate power will be so apparent that horse power will be quickly abandoned. And what we have seen in Cleveland and Columbus and other American cities we will see upon the country roads, namely: a complete substitution of electric power for horse power wherever the rails are laid.

Heretofore the use of electric cars has been confined to carrying passengers, and the extension of the system has depended wholly upon private enterprise. This must be changed by enlarging the use to which the electric cars are put, and by supplementing private enterprise by a more liberal and enlightened public policy. There is no reason why the electric roads should not be carriers of freight as well as passengers, and especially of food products from the field to the market:

It is not claimed that these electric roads could be built and maintained wholly out of the profits of the carrier, but that they should rest as a burden upon the benefited land area in the same way that other road improvements now rest. No better expenditure of public money could be made in the State of Ohio for road improvements than to build a system of electric roads connecting all the county seats with each other and with the great cities of the State. This could be done by the State or by the counties with State aid. And the roads when so built could be operated by leasing to lowest bidder or by taking toll for each vehicle, the same as the State now does from canal-boats.

I have estimated the increased value of agricultural lands resulting from the decreased cost of transportation over steel rails by inanimate power at \$30 per acre. Observation to confirm this only waits upon experiment.

MARTIN DODGE.